

2.6 Hitchhiker Ejection Capabilities Specification

The Hitchhiker carrier system provides several options for launching a small spacecraft from the Shuttle payload bay. Figure 2.75 shows a typical payload configuration. Each option requires the same maximum payload weight and CG offset and same user-supplied 9.37 inch interface plate, which attaches to the carrier with a clamp mechanism. Figure 2.76 describes this interface plate with some reference dimensions. Detailed requirements for this plate are contained in the most current revision of GD 1507205, Ejection System User Interface Control Drawing. None of the launch configurations provides any electrical power or signal connection to the spacecraft, but each provides a different satellite envelope and payload environment. The five different payload configurations listed below are shown in Figures 2.77 to 2.81.

PAYLOAD CONFIGURATIONS

Hitchhiker Ejection System (HES): always mounted in a canister.

1. with an opening door
2. with no door (open-top canister)

Pallet Ejection System (PES): canister-mounted configuration.

3. with an opening door
4. with no door (open-top canister)

Pallet Ejection System (PES): pallet-mounted configuration.

5. on top of cross-bay structure

Payload and ejection system are mounted either in a canister or on a pallet prior to orbiter installation and launch. The user must provide means for lifting the spacecraft during installation on to the ejection system. For a canister-mounted satellite, only the top of the payload will be accessible for servicing after it is installed into the canister.

Once in orbit with the Shuttle in the requested attitude, the clamp is released by the crew and the payload is ejected. The system does not provide for controlled rotation (spin) of the payload prior to ejection, but a worst case ejection torque applied about the ejection vector will be calculated for every mission. This torque is dependent on several factors. Orbital lifetime of ejected objects in typical Shuttle orbits is usually less than one year.

Spacecraft must be designed to avoid contact with the canister under launch loads and during ejection.

The ejection system and door mechanism are zero fault tolerant against a failure that would cause inability to eject or inability to close the door. Therefore, the spacecraft design must satisfy Shuttle safety requirements for a landing in the Shuttle with the door open. Spacecraft with hazardous functions that occur after ejection (such as deploying appendages) must provide adequate safety inhibits to prevent premature activation. Payloads with such functions are strongly advised to set up a Technical Interchange Meeting (TIM) with the SSPP system safety organization.

Users must select an ejection attitude and velocity that preclude any possibility of collision with the Shuttle during the portion of the mission following satellite deployment. JSC will perform a re-contact analysis to insure that no re-contact occurs.

Table 2.23 lists some characteristics and requirements of HH launcher systems. Deviations from these or other ejection system requirements are negotiable on a case-by-case basis. For example, a larger CG offset may be acceptable for a physically smaller satellite.

TABLE 2.21 CHARACTERISTICS OF HITCHHIKER LAUNCHER SYSTEMS

Maximum spacecraft weight	150 lb (68 kg)
Maximum spacecraft CG offset from separation plane	10.25 in (26 cm)
Maximum spacecraft CG offset from launcher centerline	0.25 in (0.64 cm)
Ejection velocity range	1 to 4 ft/sec (0.3 to 1.2 m/sec)

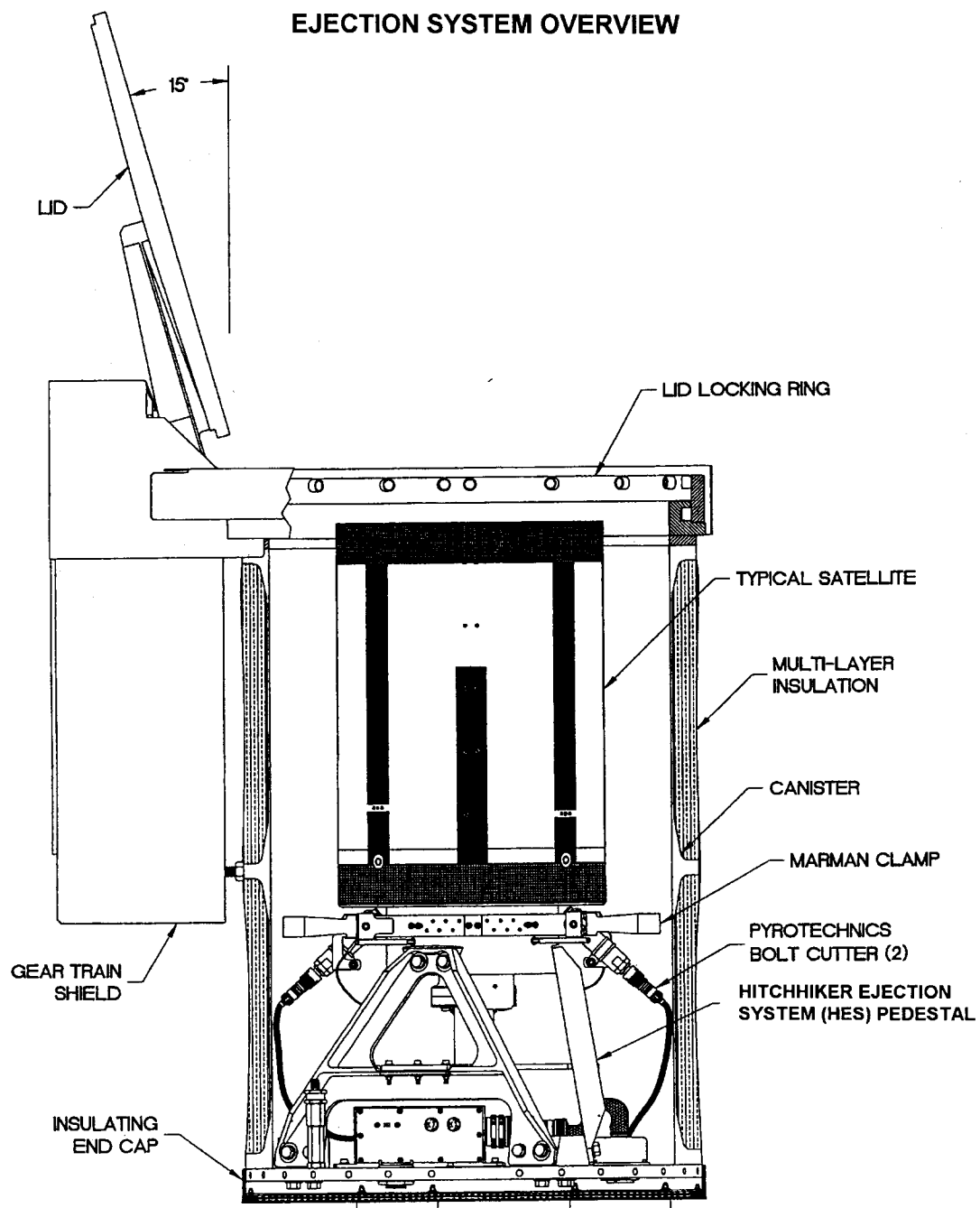


FIGURE 2.73 EJECTION SYSTEM OVERVIEW

PAYLOAD INTERFACE PLATE

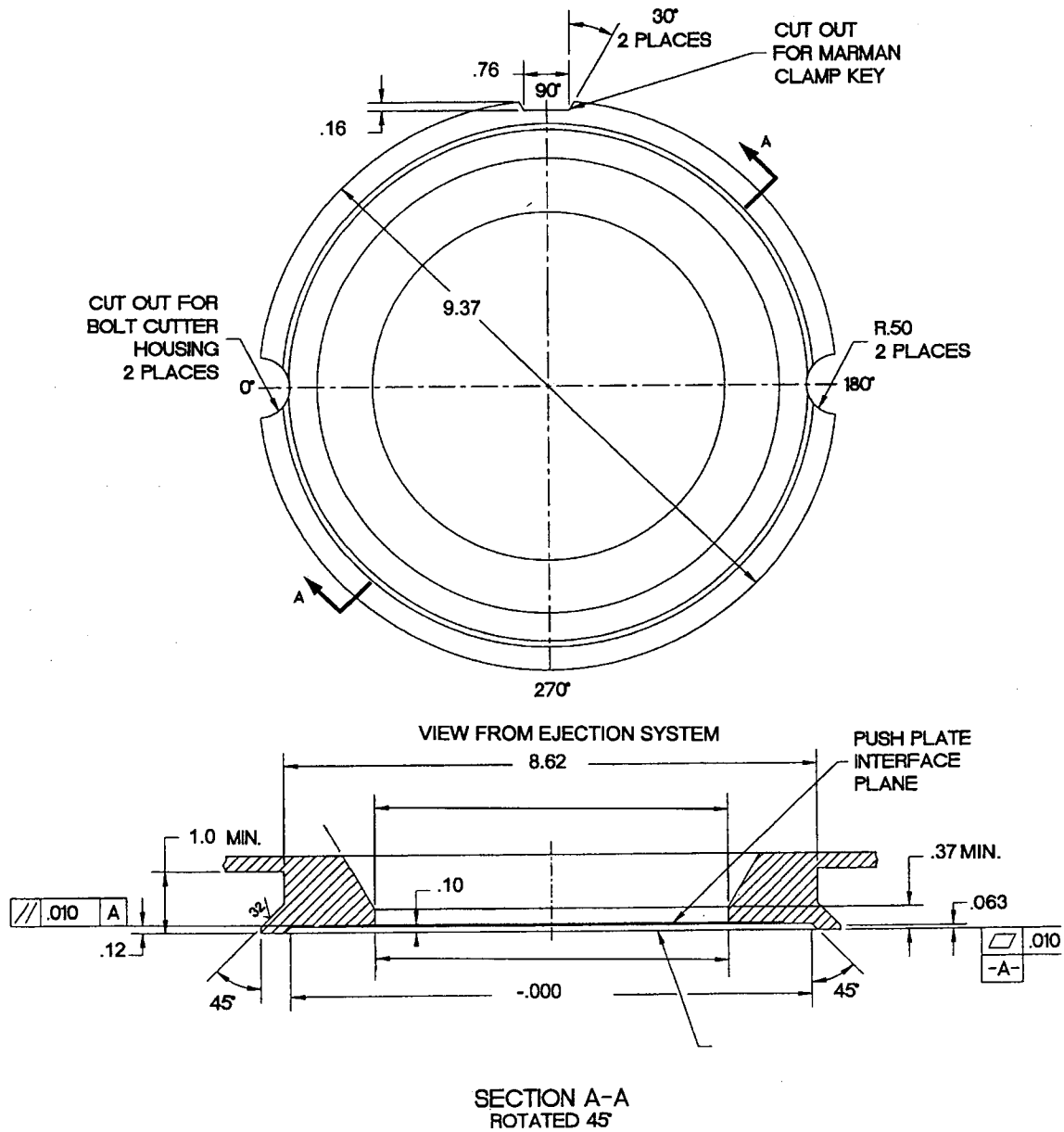


FIGURE 2.74 PAYLOAD INTERFACE PLATE

HITCHHIKER EJECTION SYSTEM WITH DOOR

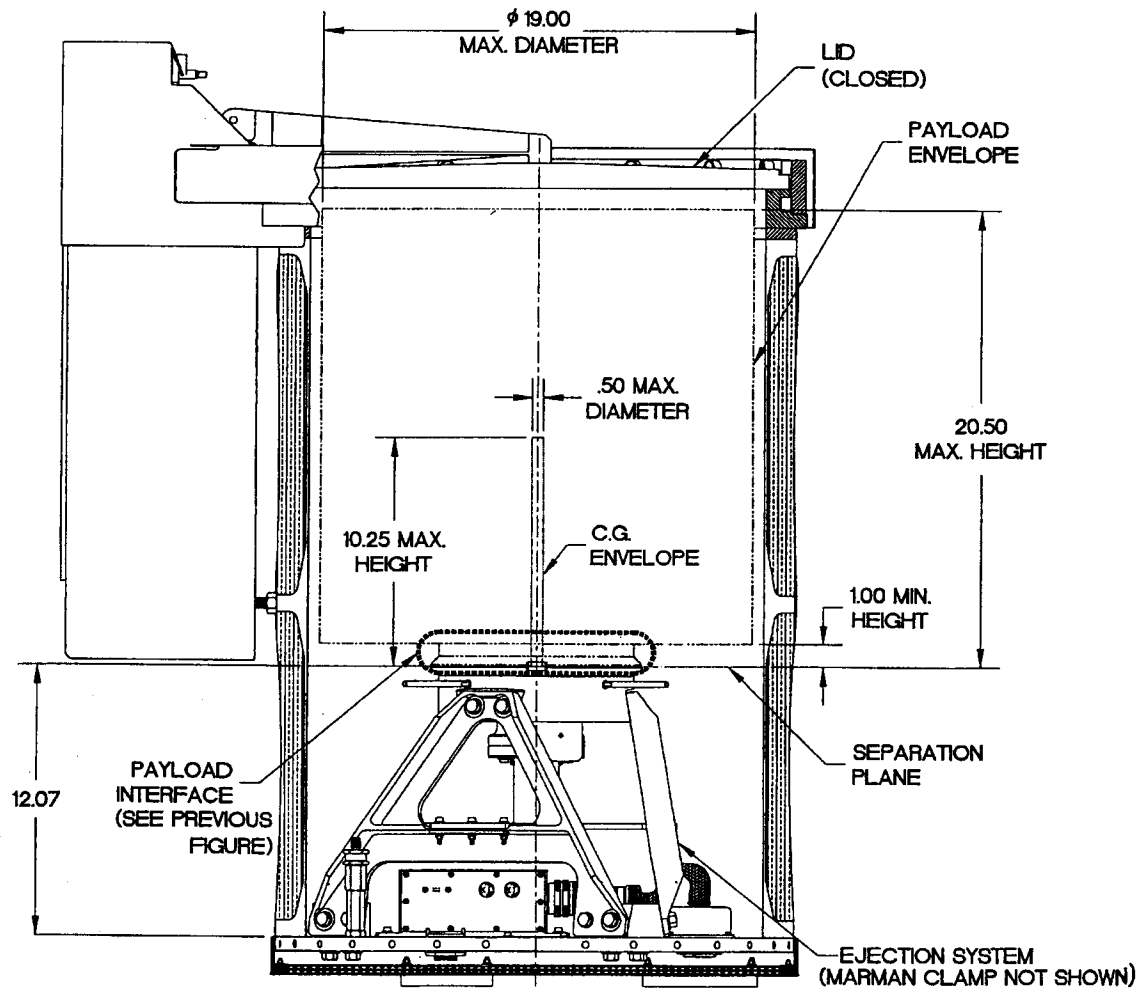


FIGURE 2.75 HITCHHIKER EJECTION SYSTEM WITH DOOR

HITCHHIKER CARRIER EJECTION SYSTEM WITH OPEN CANISTER

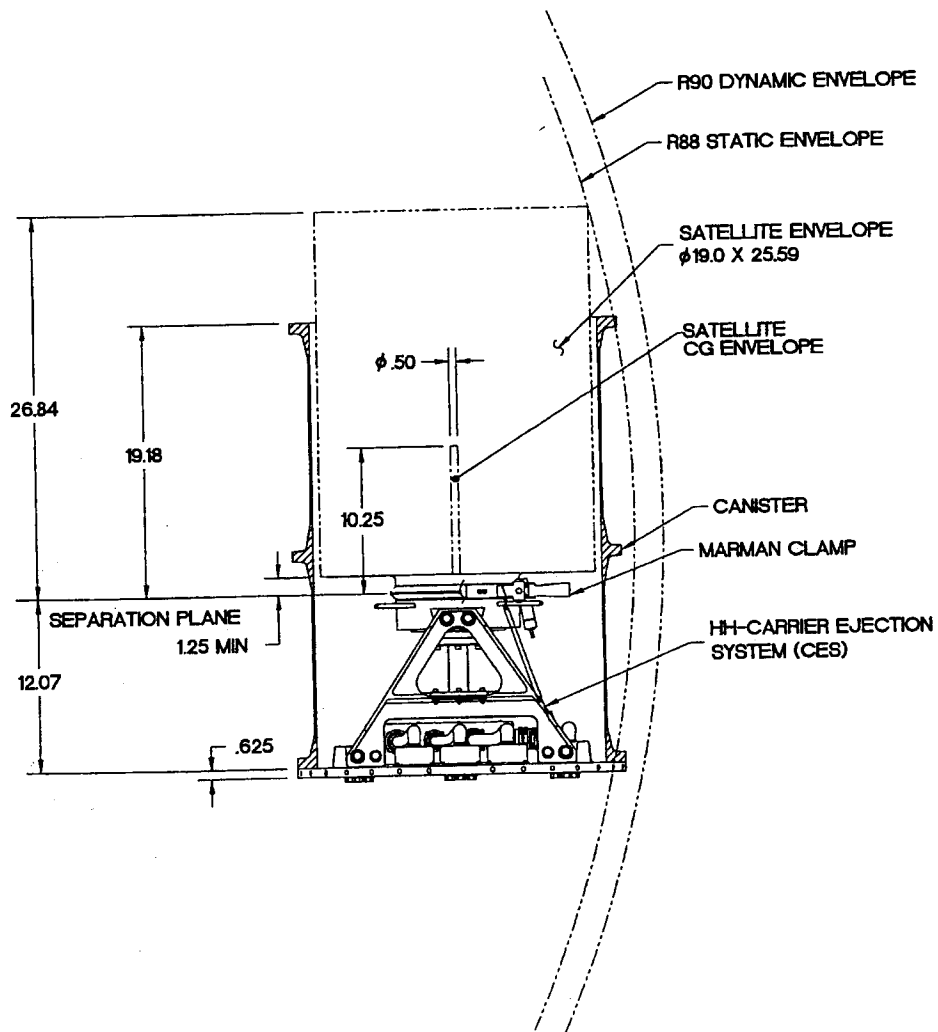


FIGURE 2.76 HITCHHIKER CARRIER EJECTION SYSTEM WITH OPEN CANISTER

PALLET EJECTION SYSTEM WITH DOOR

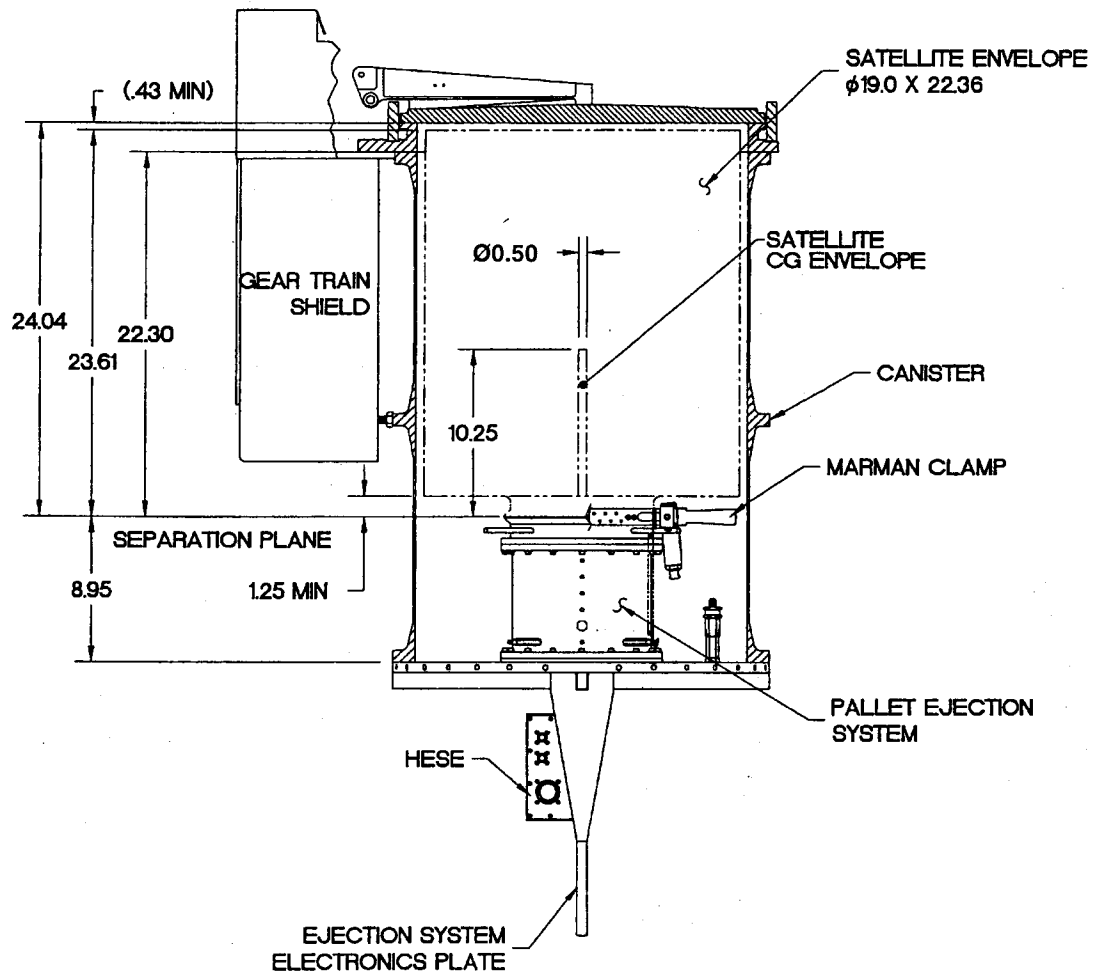


FIGURE 2.77 PALLET EJECTION SYSTEM WITH DOOR

PALLET EJECTION SYSTEM WITH OPEN CANISTER

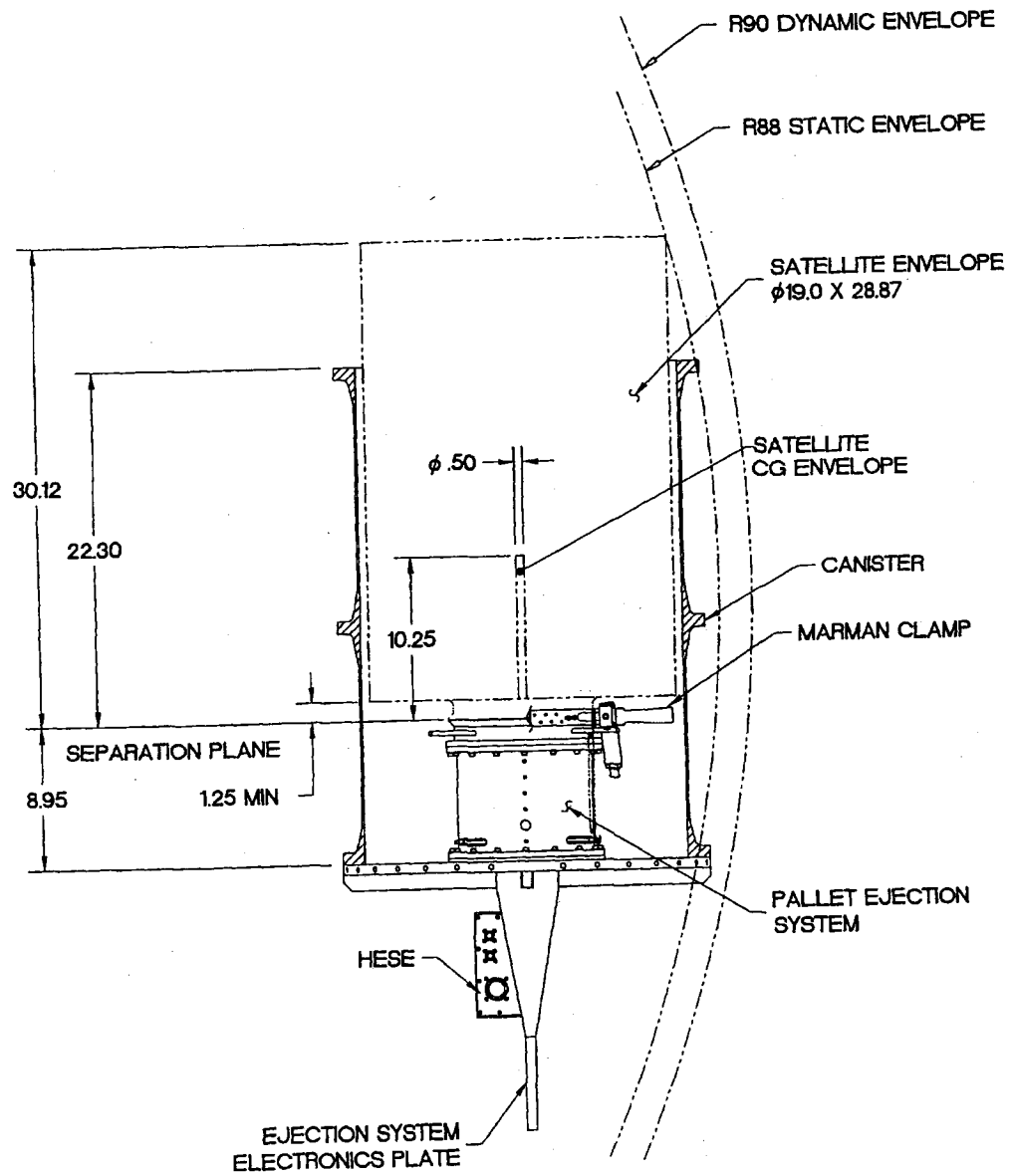


FIGURE 2.78 PALLET EJECTION SYSTEM WITH OPEN CANISTER

PALLET EJECTION SYSTEM ON SINGLE BAY PALLET

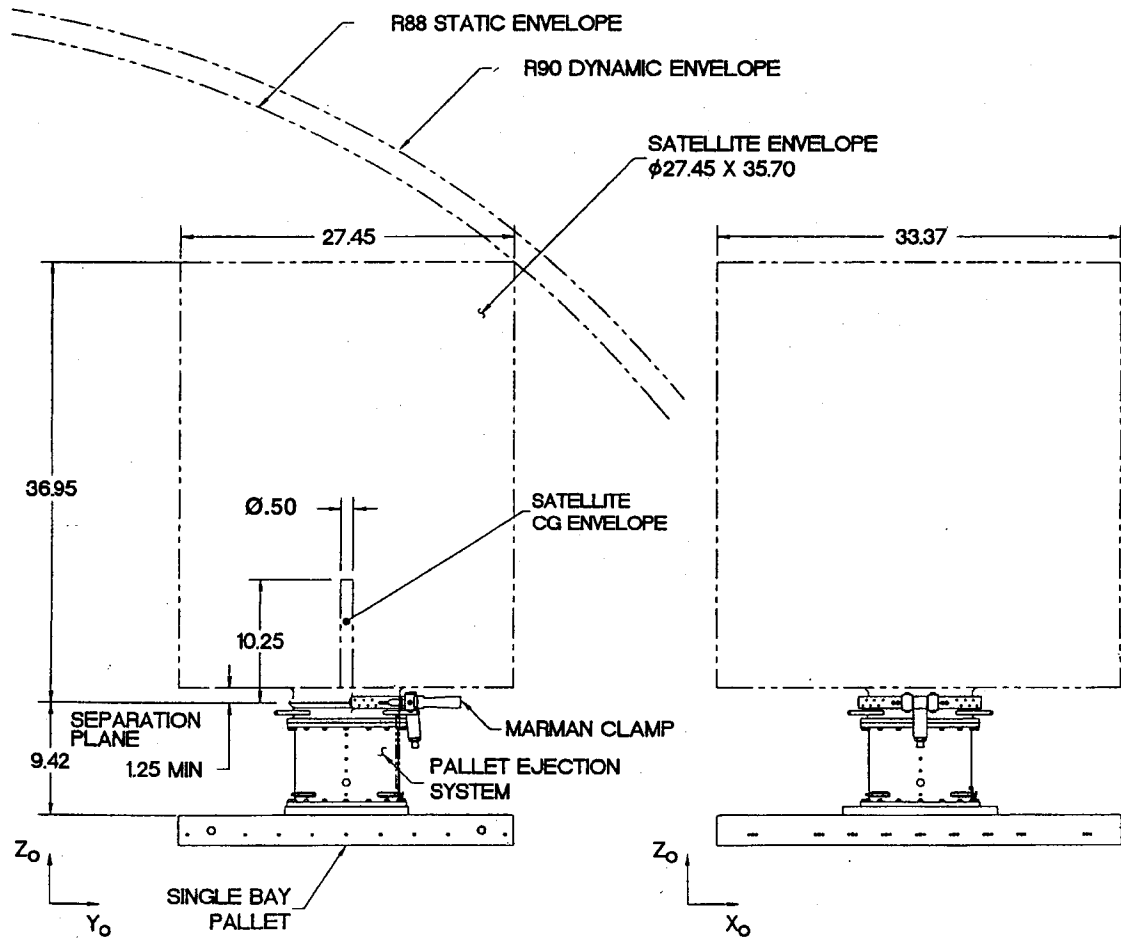


FIGURE 2.79 PALLET EJECTION SYSTEM ON SINGLE BAY PALLET